

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Appl. No. : 09/618,741	Confirmation No. : 8640
Applicant : Thomas M. Hartnett et al.	
Filed : July 18, 2000	
T.C./A.U. : 1731	
Examiner : John M. Hoffmann	
Docket No. : RTN2-118PUS (formerly 07206-118001)	

**REQUEST FOR REHEARING UNDER 37 CFR 41.52**

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* THOMAS M. HARTNETT and  
JOSEPH M. WAHL

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Appeal 2010-003537  
Application 09/618,741  
Technology Center 1700

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Before CHUNG K. PAK, CATHERINE Q. TIMM, and MICHAEL  
P. COLAIANNI, *Administrative Patent Judges*.

**REQUEST FOR REHEARING UNDER 37 CFR 41.52**

Applicant hereby requests rehearing under 35 CFR 41.52. The request is made to point out the following believed to be misapprehended or overlooked by the Board:

The Board has interpreted claim 60 as follows:

continuously converting alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature in a single reaction chamber.

It is respectfully pointed out, and as will be explained in more detail, below:

(1) The Board appears to have misunderstood the material in Maguire at col. 2, lines 49-66<sup>1</sup> and that Maguire (US 4,686,070) describes only a two-temperature step process and does not describe continuously converting alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature; and

(2) The Board appears to have misunderstood that the BACKGROUND section<sup>2</sup> of the patent application was merely describing a process known to the applicants, and described in it did not state that such known process continuously converted alumina and then to aluminum oxynitride at the same temperature.

Neither Maguire nor “AAPA”, taken either singly or in combination with any cited prior art references, but rather only the Applicants have recognized and discovered that one can continuously convert alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature in a single reaction chamber.

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<sup>1</sup> The first statement of Maguire, (i.e., “The aluminum oxide/carbon mixture is placed in an alumina crucible and is reacted in an atmosphere of flowing nitrogen at **temperatures** from 1550°C to 1850°C for **up to two hours** at the maximum temperature”) is a merely a general statement made prior to describing what happens **in the two hours; one hour for a partial reaction** to form both alpha-aluminum oxide and aluminum nitride followed by a one hour soak at 1550°C is **sufficient to convert the proper amount of Al<sub>2</sub>O<sub>3</sub> to AlN. Note the use of the plural “temperatures in the general statement; apparently overlooked by the Board. See Appeal Brief, last paragraph pg. 2; particularly pg. 3, line 3**

<sup>2</sup> This is referred to herein as Applicants Admitted Prior Art (“AAPA”)

**1. With regard to “Maguire”**

The Board’s FACTUAL FINDINGS “1”, states:

Maguire teaches a preference for forming aluminum oxynitride using a two-step process by heating in a reaction chamber aluminum oxide and carbon in the presence of nitrogen at a temperature of about 1550°C in the first step and at a temperature in the range of 1750 to 2140°C in the second step. (Maguire, col. 2, ll. 50-60). Maguire teaches that its aluminum oxide and carbon may be premixed in a crucible prior to heating in a reactor. (Maguire, col. 2, ll. 35-52 and col. 1, ll. 60-67). (Emphasis ours)

Maguire states:

The aluminum oxide/carbon mixture is placed in an alumina crucible and is reacted in an atmosphere of flowing nitrogen at **temperatures<sup>3</sup>** from 1550°C to 1850°C for up to two hours at the maximum temperature. The preferred heat treatment is in two steps. In the first step, a temperature of approximately 1550°C is used for approximately one hour, whereby, for an appropriate ratio of alumina to carbon, the temperature unstable gamma-aluminum oxide is **only partially reacted** with carbon and nitrogen to **form both alpha-aluminum oxide and aluminum nitride**. A one hour soak at 1550°C is sufficient to convert the proper amount of Al<sub>2</sub>O<sub>3</sub> to AlN. In the second step, a temperature of 1750°C or up to the solidus temperature of aluminum oxynitride (2140°C), is used for approximately 40 minutes, whereby **alpha-aluminum oxide and aluminum nitride combine to form cubic aluminum oxynitride**. (Emphasis ours)

Thus, it is clear that first statement of Maguire, (i.e., “The aluminum oxide/carbon mixture is placed in an alumina crucible and is reacted in an atmosphere of flowing nitrogen at temperatures from 1550°C to 1850°C for **up to two hours** at the maximum temperature”) is a merely a general statement made prior to describing what happens **in the two hours; one hour for a partial reaction** to form both alpha-aluminum oxide and aluminum nitride followed by a one hour soak at 1550°C is **sufficient to convert the proper amount of Al<sub>2</sub>O<sub>3</sub> to AlN**. Nothing in Maguire describes continuously converting alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature; **to the contrary**, Maguire teaches first converting at

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<sup>3</sup> Note the clear use of the plural “temperatures”

one temperature and then specifically describes that a higher temperature be used for subsequent conversion at 1750 °C.

With regard to claim 1 of Maguire, Claim 1 of Maguire states:

1. A method of preparing homogeneous aluminum oxynitride comprising the steps of:
  - introducing aluminum oxide powder and carbon black into a reaction chamber with the carbon black content being in the range of 5.4 to 7.1 weight percent;
  - providing nitrogen in said chamber; and
  - heating said chamber at a temperature in the range of about 1550 to 2140°C to react said powders and gas to produce a reacted powder substantially comprising aluminum oxynitride.

However, it is noted that claim 4 of Maguire states:

4. The method of claim 1 wherein said heating step further comprises the steps of:
  - heating said aluminum oxide powder, carbon black, and nitrogen to a temperature in the range of about 1550°C to 1620°C for a first predetermined period of time to convert said aluminum oxide carbon black and nitrogen into aluminum oxide and aluminum nitride; and
  - heating said aluminum oxide and aluminum nitride to a temperature in the range of about 1750°C to 2140°C for a second predetermined period of time to convert said aluminum oxide and aluminum nitride into the homogeneous aluminum oxynitride.

It is respectfully submitted that, in reading Maguire in its entirety, what is being described is heating the chamber at a temperature in the range of about 1550 to 2140°C; however, the aluminum oxide powder, carbon black, and nitrogen are first heated to a temperature in the range of about 1550°C to 1620°C to first convert the aluminum oxide powder, carbon black, and nitrogen into aluminum oxide and aluminum nitride and subsequently heat the aluminum oxide and aluminum nitride in the range of about 1750°C to 2140°C (i.e., a range 1000°C higher) to next convert the aluminum oxide and aluminum nitride into the aluminum oxynitride. Thus, it is clear Maguire teaches that the two conversions are performed at two different temperatures. While Maguire has described the chamber being two temperature conversion, (i.e., at 1550°C to 1620°C and subsequently at 1750°C to 2140°C) Maguire is entitled to claim that the chamber is a

temperature in the range of about 1550 to 2140°C because the chamber was at a temperature in the range of about 1550 to 2140°C; **albeit clearly not at the same temperature during both conversions.** As pointed out in Applicants brief, if a person invents a three-legged stool and claims a stool with a leg and another person subsequently invents a rotatable or swivel-like stool having “a single leg”; merely because the first person **claims** a stool “with a leg” does not prevent the second person from a patent with a claim to a stool having “a single leg” because a stool having “a single” leg had not been previously described<sup>4</sup>.

Thus, in view of the foregoing, it is respectfully submitted that perhaps the Board overlooked that, in taking Maguire in its entirety, never describes, nor even recognize, a process for continuously converting alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature in a single reaction chamber to thereby eliminating the two-temperature step process resulting in a more economical process (e.g., lowering costs of production). Maguire never suggests **continuously producing aluminum oxynitride by any method** and certainly **fail to recognize** that one can continuously convert aluminum oxynitride and more specifically, a process for continuously converting alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature in a single reaction chamber to thereby eliminating the two-temperature step process resulting in a more economical process

## **2. With regard to the “AAPA”:**

The Board states:

With respect to Appellants' arguments that AAPA teaches forming aluminum oxynitride using a two-step process, this argument is without persuasive merit because Appellants' temperature range for aluminum oxynitride formation overlaps the temperature range implemented in the process of AAPA as indicated *supra*. In other words, the claims, as properly interpreted, include continuously converting alumina and carbon to aluminum nitride and then to

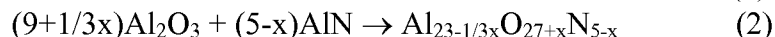
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<sup>4</sup> *In Re Vamco Machine and Tool, Inc.*, 752 F.2d 1564, 224 USPQ 617 (Fed. Cir. 1985) Note 5: **claims are not technical descriptions of the disclosed inventions but are legal documents like the descriptions of lands by metes and bounds in a deed which define the area conveyed but do not describe the land.**

aluminum oxynitride at the same temperature in a single reaction chamber as **taught** by AAPA. (Emphasis ours)

The Board appears to have misapprehended or overlooked that the BACKGROUND section of the patent application is merely describing a process known to the Applicant. It is respectfully pointed out that the Background section never states or describes that the process that the Applicants were aware of was a process that included continuously converted alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature. In this regard, the BACKGROUND section states:

AlON can be synthesized by a process sometimes called carbothermal nitridation. Generally, in this process, alumina ( $\text{Al}_2\text{O}_3$ ) is mixed with carbon (C), and this mixture is reacted under a nitrogen-containing atmosphere, e.g., dinitrogen ( $\text{N}_2$ ), at high temperatures, e.g., about 1650-1850 °C. The specific reactions that occur in the process are represented in equations 1-2.



As shown in Equation 1, a portion of alumina, carbon, and nitrogen react to form aluminum nitride, and carbon monoxide gas is produced. This reaction can occur at about 1650-1750 °C. The formed aluminum nitride then reacts with alumina, e.g., at about 1750-1850 °C, to form AlON. Synthesis of AlON by carbothermal nitridation, e.g., by conventional batch processing, can take up to about 20 to 30 hours to complete.

Thus, while process Applicants were aware of above shared a temperature of 1750 °C, just as temperatures in the two temperature ranges of Maguire overlap, it is clear that the process used two separate, non-continuous, reactions or conversions; one reaction or conversion is at a first temperature in a first temperature range to first form aluminum nitride and carbon monoxide gas from alumina and carbon and nitrogen (i.e., the conversion in equation (1)), and the Board appears to have overlooked that there is then is a second reaction or conversion at a second, higher temperature in a second temperature range 1000 °C higher than the first temperature range to convert the alumina to aluminum oxynitride (i.e., the conversion in equation (2)).

Thus, the Board's statement above indicating that the AAPA is providing a

teaching of a process is not understood; rather the Background section is advising the Examiner of a process known to the Applicant.

In view of the foregoing, it is respectfully submitted that the process known to the Applicant did not describe continuously converting alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature nor does it, taken singly or in combination with any cited prior art references, describe or even recognize, a process for continuously converting alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature in a single reaction chamber to thereby eliminating the two-temperature step process resulting in a more economical process.

### SUMMARY

Neither Maguire nor “AAPA”, taken either singly or in combination with any cited prior art references, ever suggest **continuously producing aluminum oxynitride by any method** and certainly fail to recognize that one can continuously convert aluminum oxynitride and more specifically, a process for continuously converting alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature in a single reaction chamber to thereby eliminate the two-temperature step process resulting in a more economical process.

To put it another way, neither Maguire nor “AAPA”, taken either singly or in combination with any cited prior art references, but rather only the Applicants have recognized and discovered that one can continuously convert alumina and carbon to aluminum nitride and then to aluminum oxynitride at the same temperature in a single reaction chamber.

THEREFORE, Applicant respectfully requests reversal of the Examiner’s decision.

Date: September 16, 2011

Respectfully submitted,

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